Frontier Hard Chrome
ISRM Wall Installation/Source Area Treatment
Sampling and Analysis Plan
Work Assignment Number: 153-RARA-1027

EPA Contract: 68-W7-0026

April 2003

EPA Region V

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Response Action Contract

Weston Solutions, Inc. · 190 Queen Anne Avenue North · Seattle, WA 98109-4926

FRONTIER HARD CHROME
ISRM WALL/SOURCE AREA TREATMENT
REMEDIAL ACTION SAMPLING AND ANALYSIS PLAN
VANCOUVER, WASHINGTON

Prepared for

U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

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Prepared by

Weston Solutions, Inc.
190 Queen Anne Avenue North
Suite 200
Seattle, WA 98109

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Prepared and Approved By:	David L. Dinkuhn, P.E. Project Engineer	Date: 2-21-03
Prepared and Approved By:	Larry Vanselow, P.E. Project Manager	Date: 2-21-03
Prepared and Approved By:	Paul Swift, Ph.D. Quality Assurance Manager	Date: 02/21/2003

EPA Concurrence		
Approved By:	_____ U.S. Environmental Protection Agency Project Manager	Date: _____
Approved By:	_____ U.S. Environmental Protection Agency Quality Assurance	Date: _____

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LIST OF ACRONYMS

Acronym	Definition
B	Detected concentration below the contract required detection limit but above the instrument detection limit (inorganics)
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
ºC	degrees Celsius
EDD	Electronic Data Deliverable
EPA	United States Environmental Protection Agency
ESAT	Environmental Services Assistance Team
FHC	Frontier Hard Chrome
FOWP	Field Operations Work Plan
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	Health and Safety Plan
IDW	Investigation Derived Waste
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
ISRM	In-Situ Redox Manipulation
L	Liter
MCL	Maximum Contaminant Level
MEL	Manchester Environmental Laboratory
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
MW	Monitoring Well
NA	Not Applicable
NPL	National Priorities List
ORP	Oxidation/Reduction Potential
PELs	Permissible Exposure Limits
PM	Project Manager
PNNL	Pacific Northwest National Laboratory

LIST OF ACRONYMS (continued)

Acronym	Definition
PRB	Permeable Reaction Barrier
Q	Detected concentration below the contract required quantitation limit but above the method quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QMP	Quality Management Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RPD	relative percent difference
RSCC	Regional Sample Control Coordinator
SAP	Sampling and Analysis Plan
SB	Subsurface Soil
SD	Sediment
SL	Sludge
SOPs	Standard Pperating Procedures
SS	Soil
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leachate Procedure
TBD	To Be Determined
TDD	Technical Direction Document
USGS	United States Geologic Survey
WDOE	Washington Department of Ecology
WS	Waste

SECTION 1

INTRODUCTION

1.1 PURPOSE/ORGANIZATION

1.1.1 Purpose

This Sampling and Analysis Plan (SAP) is intended to be used as a guide for conducting sampling activities to support the remedial action (RA) at the Frontier Hard Chrome (FHC) site in Vancouver, Washington. The RA consists of installation of an Insitu Redox Manipulation (ISRM) Treatment Wall and Source Area Treatment. This document is intended to "stand alone" regarding remedial action sampling activities and contains the Field Sampling Plan and Quality Assurance Project Plan.

This SAP describes in detail the sampling and data gathering methods that will be used during the RA, including sampling objectives and responsibilities, sample location and frequency, sampling equipment and procedures, sample handling and analysis, project objectives, and quality assurance and quality control (QA/QC) procedures that will be used to achieve the desired data quality objectives.

1.1.2 Project Roles

Weston's project management and responsibilities are described in detail in the *Remedial Action Work Plan for Chemical Stabilization of Chrome in Soil and Groundwater* (Weston 2003a).

The sampling events described in this FSP are primarily to be conducted by field personnel from the Environmental Services Assistance Team, and Weston. The field personnel will be responsible for sample collection, field analyses, and sample documentation, including labeling and chain of custody, sample storage, and shipment of samples to the assigned off-site laboratory. ESAT/Weston efforts will be performed in conjunction with other investigation tasks conducted by Pacific Northwest National Laboratory (PNNL). Field sampling to be conducted by PNNL is also covered in this plan.

1.2 SITE DESCRIPTION AND BACKGROUND

The FHC site is located at 113 "Y" Street, Clark County, Vancouver, Washington. It is approximately one-half mile north of the Columbia River and is within the river's historical floodplain. The site's geographical coordinates are 45 deg. 37 min. 16 sec. N. latitude; 122 deg. 38 min. 39 sec. W. longitude. A map of the site vicinity is provided in Figure 1. A site diagram illustrating site features is presented in Figure 2.

The site was the location of chrome plating operations for approximately 25 years between 1958 and 1983. Prior to 1955, the site was used as an open storage area for neighboring

businesses. In 1955, the site was filled with hydraulic dredge material and construction rubble. Since then, the site has been primarily occupied by two businesses, both engaged in chrome plating. Pioneer Plating operated at the site from 1958 to 1970. The site was then occupied by FHC until 1983.

FHC has had two different Records of Decision (RODs). One in 1987 dealt with the cleanup of chrome-contaminated soils at the site. The second ROD, in 1988, dealt with the cleanup of contaminated groundwater. Since the original RODs were issued, EPA has continued to monitor groundwater and soils, and evaluate new, innovative cleanup technologies to address the persistently high concentrations in soils and groundwater at the FHC site. In May 2000, the United States Environmental Protection Agency (EPA) finalized a Focused Feasibility Study (FS) which identified and evaluated several new and innovative technologies for addressing the problems at the site.

In late 2001, EPA issued a Record of Decision for cleanup of both soils and groundwater at the site. The ROD identified in-situ treatment using reducing compounds as EPA's Preferred Alternative.

One of the promising new in-situ treatment technologies identified in the Focused FS, In-Situ Redox Manipulation, or ISRM, was further evaluated in a bench scale test. The results of the bench scale test indicated that the technology would be appropriate for use at the FHC site (PNNL 2002).

Recent site activities in support of RA design have included the performance of a Geoprobe groundwater characterization study, installation of eleven monitoring wells and two treatment wells, and an ISRM Treatment Wall pilot scale study. These activities are described in the *Frontier Hard Chrome Remediation Design Final Data Evaluation Report* (Weston 2003b). Above-ground structures at the Facility (including the Frontier Hard Chrome Building, the adjacent Richardson Metal Works Building, and out buildings) were demolished by Weston in late January/early February 2003.

1.3 ACCESS COORDINATION AND UTILITY CLEARANCE

The FHC property is currently under a EPA Unilateral Access Agreement. EPA, Weston and its subcontractors have access to this site for site remediation activities.

Site utilities were located and are shown in the *Frontier Hard Chrome Remediation Design Final Data Evaluation Report* (Weston 2003b). All areas where intrusive site activities will take place will be reviewed for utility clearance prior to initiation of activities. Utility clearance will be performed by personnel performing the activities. Such personnel include the soil treatment contractor, Weston, and ESAT. Weston will have the primary responsibility of clearing areas prior to performing intrusive work.

1.4 DATA COLLECTION ACTIVITIES SUMMARY

Data collection activities outlined in this FSP correspond with three major site tasks as discussed below:

1. *Site Debris*—Samples of various site materials (wood, concrete, metal) will be collected for disposal characterization. These materials may be generated during ISRM Wall Installation, Source Area Treatment or during other site activities.
2. *ISRM Wall Installation*—Groundwater samples will be collected for baseline characterization purposes from 1) seven Geoprobes installed at the locations of the proposed ISRM Wall alignment and 2) thirteen existing monitoring wells. Following ISRM Treatment Wall installation, groundwater samples will be collected from six treatment wells, 9 operational/functional wells as well as up- and downgradient monitoring wells to evaluate performance. Wastewater and injection withdrawal water generated during ISRM wall installation will be tested for hexavalent chromium, sulfur and total dissolved solids prior to disposal.
3. Source Area Treatment—Soil samples will be collected for characterization of treated soil during treatment optimization testing, full scale testing, and to verify that off site areas were not impacted by site activities. Groundwater samples will also be collected during treatment optimization testing and full scale treatment to assess treatment effectiveness. Air monitoring samples will also be collected to assess site worker and community exposure.

The specific procedures to be followed during field sampling for these investigations are discussed in Sections 2.1, 2.2, and 2.3.

1.5 MODIFICATIONS TO PROJECT ACTIVITIES

Additional sampling and evaluation may be performed or planned activities may be modified. Prior to any such modifications, the FSP will be updated in the form of an addenda.

1.6 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

No special training requirements or certifications are required for this project except for current 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) certification. Health and safety procedures for Weston personnel and Weston subcontractors are addressed in the Weston site-specific health and safety plan (HASP). Copies of this document are maintained in Weston's Seattle office and at the project site. Included in the plan are descriptions of anticipated chemical and physical hazards, required levels of protection, health and safety monitoring requirements and action levels, personal decontamination procedures, and emergency procedures. All field personnel and required to read and comply with the plan. Non-Weston personnel (e.g., ESAT and PNNL) and Weston subcontractors are also required to develop and implement their own site-specific health and safety program that incorporates the provisions of the Weston HASP.

SECTION 2

FIELD SAMPLING PLAN

2.1 SITE DEBRIS

2.1.1 Creosote Wood Piling

Wooden creosote piling removed to support source area treatment will be sampled for either recycling or disposal purposes. A total of five samples will be collected from the piling for recycle/disposal characterization. Weston will collect the samples using a wood boring bit that will be extended through the entire width of the pile being sampled. The wood samples will be analyzed for total Resource Conservation and Recovery Act (RCRA) metals. Samples with an excess of 20 times the RCRA toxicity characteristic criteria for any metal will be analyzed using the Toxicity Characteristic Leachate Procedure (TCLP). Proper disposal for the piling will be determined based on the analytical results.

2.1.2 Other Debris

Previous explorations have established the presence of large debris (concrete and asphalt primarily) buried in the eastern portion of the source treatment area. Debris that inhibits the treatment process may be removed from the ground and will require characterization for disposal. Up to 10 debris samples will be collected by Weston (using appropriate methods) and submitted to the laboratory for total RCRA metals analysis. Samples with an excess of 20 times the RCRA toxicity characteristic criteria for any metal will be analyzed using the Toxicity Characteristic Leachate Procedure (TCLP). Determination of proper disposal will be based on the analytical results.

Table 2-1 presents the anticipated number of samples, analytical methods, specific requirements for sample container size and type, sample preservation and holding times, and special handling requirements for samples expected to be collected for this task. Table 2-2 summarizes the number of field, and QA/QC samples to be submitted according to the method requirements.

2.1.3 Site Debris Sampling Summary

Table 1 presents the anticipated number of samples, analytical methods, specific requirements for sample container size and type, sample preservation and holding times, and special handling requirements for samples expected to be collected during this task. Table 2 summarizes the number of field, and quality assurance/quality control (QA/QC) samples to be submitted according to the method requirements.

2.2 ISRM WALL INSTALLATION

2.2.1 Wall Alignment Characterization

ESAT will install and sample Geoprobes to depths of 40 feet at 7 locations for along the ISRM Wall alignment in order to characterize the soil profile and groundwater conditions. The approximate locations of the new injection wells are shown on Figure 2. Exact locations for the wells are shown in the ISRM Treatment Wall Design document (Weston 2002a). Borehole logging will be performed by a Weston employee who is also a registered professional engineer. Weston will provide a licensed professional engineer for oversight of the Geoprobe activities. ESAT will install the Geoprobes (using a Geoprobe model 6600) and collect soil and groundwater samples in accordance with ESAT SOP FASP-045 (Appendix A). A copy of SOP FASP-045 will be carried in the field by ESAT.

A Geoprobe sampler is a truck-mounted, hydraulically powered hammer/ram sampling device that drives hollow steel rods into the ground to the desired sampling depth. For the purposes of obtaining a discrete groundwater sample, the Geoprobe sampler will be configured with a 4-foot stainless-steel, screened sampling chamber. This screened sampling chamber is housed inside a protective sleeve that restricts groundwater from entering the chamber until the desired sampling depth is reached. At the desired sampling depth, the protective sleeve is retracted to allow groundwater to enter the chamber. The groundwater samples will be collected using dedicated polyethylene tubing deployed down the center of the casing and fitted to a peristaltic pump. An inertial lift sampler attached to dedicated polyethylene tubing may also be used.

Field screening groundwater samples will be collected from depths of 20 feet, 25 feet, 30 feet, 35 feet, and 40 feet in each Geoprobe. Purging of the groundwater prior to sampling is not required when using a Geoprobe sampler. Measurements of temperature, pH, conductivity, oxidation/reduction potential (ORP), and dissolved oxygen will be recorded for each sample upon collection. Each groundwater sample will be passed through a 0.45-micron filter and analyzed in the field for dissolved hexavalent chromium. Field analyses will be conducted using Hach test kit #12710 for hexavalent chromium. One groundwater sample from each Geoprobe (for a total of 7) will be submitted to the laboratory for dissolved metals analysis. The groundwater sample submitted to the laboratory will consist of the sample with the highest concentration of hexavalent chromium.

During the installation of the Geoprobe, continuous soil samples will be collected below the depth of 10 feet for the purposes of logging the soil profile. Boring logs for the Geoprobes will be completed by Weston. The Geoprobes will be completed as temporary, 2-inch diameter PVC monitoring wells screened from below the native silt to the bottom of the Geoprobe. The seven temporary monitoring wells will be developed by ESAT. Development will be performed using an inertial lift pump equipped with a surge block. Development flow rates of up to 1 gallon per minute will be achieved. Development goals will include stabilization of the water quality parameters, temperature, conductivity, pH, and turbidity (development water will be disposed by Weston). After the temporary well has been completed, PNNL will complete borehole flowmeter testing. Following borehole flow meter testing (performed concurrently by PNNL during temporary well installation), the temporary wells will be removed by ESAT. The hole resulting

from pulling the well will be filled with sand (injection wells will be installed in this location by a well drilling subcontractor shortly after removal).

Thirteen existing wells (Figure 3) will be sampled by ESAT for groundwater characterization. Groundwater will be sampled using a peristaltic pump and new polyethylene tubing deployed to mid-screen depth. Monitoring well construction logs are provided in Appendix B. The volume of water to be purged prior to sampling will be determined by the stabilization of monitored field parameters (conductivity, pH, dissolved oxygen, ORP, and temperature) as described in "Groundwater Sampling Guidelines for Superfund and RCRA Project Managers" (Appendix A). Additional guidelines are also provided in the Weston Standard Operating Procedure (SOP) for Low-Flow Groundwater Sampling (Appendix A). Upon collection, each groundwater sample will be passed through a 0.45-micron filter and analyzed for hexavalent chromium. The samples will also be analyzed for dissolved metals at a laboratory.

Stabilization criteria are listed below:

Parameter	Value
pH	± 0.1 unit
Specific conductance	± 3%
Oxidation-reduction	± 10 millivolts
Turbidity	± 10% (When turbidity is greater than 10 NTUs)
Dissolved Oxygen	± 0.3 milligram per liter

2.2.2 Injection Well Installation Testing

PNNL personnel will perform groundwater sampling during the full scale injections to track operational performance and collect data to determine the radius of influence and efficiency of the new ISRM treatment wells. PNNL will sample surrounding operation wells for field parameters such as conductivity. These samples will be analyzed in PNNLs onsite laboratory by PNNL.

2.2.3 Injection Well Withdrawal Water Sampling

PNNL will collect and provide approximately 40 groundwater samples to Weston for preparation and shipment to the laboratory. These samples will be collected from withdrawal water to determine the efficiency of the withdrawal process and to provide information to the City of Vancouver for disposal purposes. Sample analyses will include total dissolved solids and total sulfur.

2.2.4 Operational and Functional Sampling

Six of the fourteen new treatment wells, nine new operational wells (wells used to monitor the operation of the ISRM Treatment Wall), and two new downgradient monitoring wells will be sampled after ISRM Treatment Wall installation to evaluate the walls performance (see

Figure 2). The exact six treatment wells to be sampled will be determined after the ISRM Treatment Wall has been installed. See the ISRM Treatment Wall Design document (Weston 2002a) for specific well installation details.

ESAT will sample groundwater from these seventeen wells and one existing upgradient well for the purpose of determining the efficiency of the wall in treating hexavalent chromium following the installation. The eighteen wells will be sampled during six rounds for at total of 108 samples. Sample rounds will be scheduled for 2 weeks and 6 weeks after wall completion and quarterly for one year thereafter. Groundwater purging, stabilization, and sampling will be conducted as described in Section 2.2.1 above. Groundwater samples will be analyzed in the field for total hexavalent chromium concentrations using Hach test kit #12710. Samples will also be analyzed at the laboratory for total metals and chlorinated solvents. [Note: chlorinated solvents are being analyzed at the request of the Washington State Department of Ecology and is related to an offsite upgradient solvent source]. In cases where turbidity is excessive (>10 NTU), dissolved samples may also be collected. Field parameters will be measured using a MicroPurge MP20 flow cell or equivalent (see Appendix A).

2.2.5 Investigation Derived Waste

Waste water generated during well installation, testing, and sampling will be collected and stored on site in a 6,500-gallon Baker tank provided by Weston. This water will be treated on site using sodium metabisulfite and tested for hexavalent chromium concentrations using Hach test kit #12710. Water meeting treatment criteria will be disposed of in the sanitary sewer. Treatment and disposal will be performed by Weston. Treatment criteria will be determined by the City of Vancouver. EPA's Project Manager will coordinate with the City of Vancouver and obtain a disposal permit.

2.2.6 ISRM Wall Installation Sampling Summary

Table 1 presents the anticipated number of samples, analytical methods, specific requirements for sample container size and type, sample preservation and holding times, and special handling requirements for samples expected to be collected during this task. Table 2 summarizes the number of field, and quality assurance/quality control (QA/QC) samples to be submitted according to the method requirements.

2.3 SOURCE AREA TREATMENT

2.3.1 Treatment Optimization Testing

Soil treatment activities are described in detail in the Source Area Treatment Design document (Weston 2003c). During treatment optimization testing, ESAT will collect soil and groundwater samples in the test area to determine the effectiveness of the treatment. Weston will direct sampling activities. Up to eight soil samples will be collected using the Geoprobe rig from depths of 1/3 and 2/3 the soil treatment depth. Up to four groundwater samples will be collected from the midpoint of the treated water column. Soil samples will be analyzed in the field for

hexavalent chromium. Field analyses will be conducted by ESAT using Hach test kit #24618 for hexavalent chromium. Each groundwater sample will be passed through a 0.45-micron filter and analyzed in the field for dissolved hexavalent chromium.

Four grab samples of surface fluff soil will also be collected (by Weston) and analyzed for total RCRA metals by the laboratory. Samples with an excess of 20 times the RCRA toxicity characteristic criteria for any metal will be analyzed using the Toxicity Characteristic Leachate Procedure (TCLP). The results of these analyses will be used to plan proper disposal methods for the fluff soil that will be generated for disposal during the source area soil treatment.

2.3.2 Full Scale Treatment Testing

During full scale soil treatment, ESAT will use the Geoprobe rig to collect soil and groundwater samples in the treated areas to verify treatment. Weston will direct sampling activities. One soil sample will be collected for each 500 to 1,000 cubic yards (cy) of treated soil. Up to 46 soil samples will be collected from depths of 1/3 and 2/3 the treated soil depth. One groundwater sample will be collected from each 1,600 square feet of treated area for a total of sixteen groundwater samples. The groundwater samples will be collected from the midpoint of the treated water column. Each groundwater sample will be passed through a 0.45-micron filter and analyzed in the field for dissolved hexavalent chromium. Soil samples will also be analyzed in the field for hexavalent chromium. Field analyses will be conducted by ESAT using Hach test kit #24618. Groundwater duplicate samples (10%) will be sent to an offsite laboratory for hexavalent chromium analysis.

2.3.3 Surface Fluff Soil Characterization

The soil treatment process will have a "fluffing" effect that will increase the treated soil volume. It is expected that treatment will produce a mound of soil up to 6 feet higher than the original ground surface. This fluff soil will be removed to original grade and disposed. Weston will collect a five-point composite sample for every 500 cy of fluff soil for disposal characterization purposes. Up to 20 fluff samples will be submitted to the laboratory for total RCRA metals. Samples with an excess of 20 times the RCRA toxicity characteristic criteria for any metal will be analyzed using the Toxicity Characteristic Leachate Procedure (TCLP). Determination of proper disposal will be based on the analytical results.

Weston may also prepare a procedure for a simple fluff soil stabilization test to determine the likelihood of fluff soil being a hazardous waste. Weston anticipates ESAT performing this test and characterizing the resulting soil. Pre-stabilized soil would be analyzed for totals metals and post-treated soil would be analyzed for total metals and TCLP metals. It is estimated that 4 samples would be analyzed for total metals and 2 samples would be analyzed for TCLP metals.

2.3.4 Off Site Area Sampling

To verify that soil treatment activities have not resulted in unacceptable offsite concentrations of chromium, Weston will collect surface soil samples from locations adjacent to the treatment area. One surface soil samples will be collected from every 100 feet of roadway leaving the site on

both sides (for a total of 10 samples) and soil samples will be collected from adjacent areas at locations 50 feet to 75 feet from the boundary of the treatment area (for a total of 15 samples). These 25 samples collected will be analyzed for total chrome.

2.3.5 Air Monitoring

Weston will conduct air monitoring during source soil treatment to assess exposure to site workers and the community. Specific air monitoring procedures and action levels are outlined in the *Frontier Hard Chrome Remediation Design Site Management Plan* (Weston 2002b). Permissible exposure limits (PELs) are provided in the Weston HASP. Up to 150 filter cassettes will be collected and analyzed for arsenic, beryllium, cadmium, chromium, copper, lead, nickel, and zinc.

2.3.6 Source Area Treatment Sampling Summary

Table 1 presents the anticipated number of samples, analytical methods, specific requirements for sample container size and type, sample preservation and holding times, and special handling requirements for samples expected to be collected during this task. Table 2 summarizes the number of field, and quality assurance/quality control (QA/QC) samples to be submitted according to the method requirements.

2.4 SCHEDULE

The sampling schedule for site work is provided below. This schedule is subject to change based on contractor scheduling.

Activity	Date
ISRM Wall Alignment Characterization	Mar 5 – Mar 20, 2003
Site Debris Characterization	May 5 – Sept 30, 2003
Injection Well Withdrawal—Phase 1	May 16 – June 10, 2003
Injection Well Withdrawal—Phase 2	July 30 – Aug 26, 2003
Source Area Treatment—Optimization Testing	June 20 – June 26, 2003
Source Area Treatment—Full Scale Treatment Testing	June 27 – Sept 11, 2003
Source Area Treatment—Surface Fluff Soil	July 4 – Sept 30, 2003
Source Area Treatment—Offsite Sampling	Sept 30 – Oct 7, 2003
Source Area Treatment—Air Monitoring	June 20 – Sept 30, 2003
ISRM Wall Operational/Functional Sampling—Round 1	Sept 9 – Sept 23, 2003
ISRM Wall Operational/Functional Sampling—Round 2	Oct 7 – Oct 21, 2003
ISRM Wall Operational/Functional Sampling—Round 3	Jan 21 – Feb 4, 2004
ISRM Wall Operational/Functional Sampling—Round 4	April 21 – May 5, 2004
ISRM Wall Operational/Functional Sampling—Round 5	July 21 – August 4, 2004
ISRM Wall Operational/Functional Sampling—Round 6	Oct 21 – Dec 5, 2004

2.5 SAMPLE DESIGNATION

All samples collected will be assigned a unique sample number from the EPA Regional Sample Control Center, which will be reported to the laboratory for sample tracking purposes. In addition, all samples will be assigned a unique Weston identification code based on a consistent sample designation scheme that is designed to suit the needs of the field staff, data management and data users. The Weston codes will not be reported to the laboratory but will be maintained for internal use.

All samples will consist of four components separated by a dash. These components are site ID, media code, station code, and sample type. The sample designation scheme is as follows:

Site ID		Media Code		Station Code		Sample Type
SSS	-	MM	-	SSsss	-	t [ddd]

The four components are described in the following sections.

Site ID

The site ID component is a three-digit code that designates the specific EPA site sample. This is based on the Weston project phase code. The Site ID code assigned to this investigation is FHC for Frontier Hardchrome.

Media Code

The media code is a two-character code that defines the media type of the sample. The media codes designated for this project are as follows:

AA — Air/Filter Media
DD — Debris
GW — Groundwater
SO — Soil
WT — Water (other)

Station Code

The station code component is a five-character code that uniquely identifies each sampling station. The station code component has two parts: a two letter station designation XX indicating the area where the sample was collected followed by a three number sequential component (i.e., 001, 002, 003). The station codes designated for this project are as follows:

CC — Concrete
MW— Monitoring Well
MT — Metal
PP — Geoprobe

SB — Soil Boring
SS — Surface Soil
IW — Investigation-derived Waste

Sample Type

The sample type component has two parts: a sample type field "t" and a sample depth field "ddd." The single character "t" indicates a sample type having one of the following two values:

0### — Field sample
1### — Duplicate sample
4### — Equipment Rinsate Blank

and a three-character field to indicate depth in tenths of feet to the top of the sample:

#000 — 0 foot (surface)
#050 — 5 feet
#125 — 12.5 feet

Sample depth determinations will be made to the nearest 0.5-foot.

Examples

Examples of complete sample numbers with descriptions are as follows:

FHC-GW-PP030-0300:	A field groundwater sample collected from Geoprobe station PP030 at a depth of 30.0 feet bgs.
FHC-WT-PP030-4300:	A rinsate blank collected from the sampling equipment to be used for collecting the groundwater sample from station GP030.
FHC-SO-SB001-0045	A field subsurface soil sample collected from soil boring SB001at a depth of 4.5 feet bgs.
FHC-WT-IW001-0000	A sample of decontamination waste water from the decontamination station.

Under the sample designation method described above, the identifier will be unique (i.e., no two samples will have the same identifier), and informative (i.e., will show method of collection, location, sample type, and depth interval). This designation scheme will facilitate data management and tracking during the evaluation of site data.

Since the proposed sample designation scheme contains a great deal of specific sample information, the sample number will not be entered on laboratory chain-of-custody forms. Only EPA sample numbers will be used to identify samples. Weston will maintain a cross-reference of the proposed sample designation scheme numbers and EPA sample numbers.

2.6 SAMPLING EQUIPMENT DECONTAMINATION

Sampling equipment decontamination will be required to prevent contamination of clean areas and cross-contamination of samples, and to maintain the health and safety of field personnel.

Decontamination of all non dedicated sampling equipment will occur prior to sampling. Dedicated or disposable sampling equipment will also be used when feasible to reduce the possibility of sample cross-contamination and decontamination efforts during field activities; however, it is anticipated that some sampling equipment will require repeated decontamination in the field. The equipment which is likely to require field decontamination includes, but is not limited to Geoprobe sampling tools and non dedicated submersible groundwater sampling pumps.

Hand-held, reused sampling tools coming in direct contact with samples will be decontaminated as follows:

1. Clean with tap water and nonphosphate detergent using a brush if necessary to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with analyte free water.
4. Air dry the equipment completely, if possible, away from sources of contamination.
5. Remove the equipment from the decontamination area and cover with plastic.

Non-dedicated submersible groundwater sampling pumps will also require decontamination between samples. The pump(s) will be decontaminated by placing it into a tub containing non-phosphate detergent and deionized water and then turning it on and allowing it to cycle the solution for a minimum of 5 minutes. Next the pump will be placed into a tub containing deionized water and cycled for another 5 minutes. The pump will then be placed in a third tub for a third and final deionized water rinse.

Geoprobe sampling tools such as the probe sections and the groundwater sampling screen will be decontaminated using a high-pressure, hot water wash.

Decontamination will be conducted in a designated area on plastic sheeting to prevent decontamination water from contaminating nearby surfaces. Used decontamination solutions will be placed in a drum to await disposal.

2.7 SAMPLE HANDLING

2.7.1 Sample Labeling

Sample containers will be labeled and covered with clear tape prior to sampling or labeled immediately after material is placed in the sample container to prevent damage to the sample label from spillage of material during collection. Each label will include the following information, written or typed in permanent ink:

- EPA sample number
- Date
- Time (24-hour clock)
- Initials sampler
- Preservative (if any)
- Requested analysis

2.7.2 Sample Containers, Preservation, and Holding Times

Samples will be preserved as described in specific analytical procedures presented in the EPA CLP statements of work for organic and inorganic analyses, or the individual analytical methods. Sample preservation, holding time, and container requirements vary according to analyte, sample matrix, and hazard classification. It is anticipated that all samples collected will be low hazard. Table 2 includes the type and number of sample containers and preservation and holding time requirements specific to the groundwater, soil, and sediment analyses to be performed.

2.7.3 Sample Custody

The purpose of custody procedures is to provide a documented, legally defensible record that can be used to follow the possession and handling of a sample from collection through analysis. A sample is in custody if it meets at least one of the following conditions: it is in someone's physical possession or view; it is secured to prevent tampering; or, it is secured in an area restricted to authorized personnel.

Sample control and chain-of-custody procedures in the field and during shipment will be performed in accordance with the procedures in the *Contract Laboratory Program (CLP) Guidance for Field Samplers* (EPA 2001). A chain-of-custody record will be completed for each container of samples (i.e., cooler) during the course of the daily sampling activities or at the end of each day of sampling. Custody seals will be placed on each cooler containing the samples in such a manner that the cooler cannot be opened without breaking the custody seals. The completed chain-of-custody forms will be delivered to the recipient laboratory with the respective samples.

The QA officer at each laboratory will ensure that the cooler custody seals are unbroken and that the chain-of-custody records completed and signed in the field are properly transferred to the laboratory upon receipt of the samples. Any questions or observations concerning sample integrity will also be noted.

2.7.4 Sample Packaging and Shipment Requirements

Packaging, marking, labeling, and shipping of samples will comply with all applicable regulations promulgated by the U.S. Department of Transportation (DOT) in the Code of Federal Regulations (49 CFR 171-177) or International Air Transport Association (IATA) regulations, as applicable.

In accordance with the above regulations and guidance, packaging and shipping of samples will be done in a manner that protects both sample integrity and the shipment handlers from the possible hazardous nature of samples. Individual sample containers will be placed in resealable plastic bags. These individual packages will then be placed in polyethylene liner bags in an appropriate shipping container. Double-bagged ice will be placed on top of the samples. Chain-of-custody forms and any other pertinent sample documentation information will be placed in a resealable plastic bag and taped to the inside cover of the cooler; custody seals will then be affixed to the cooler. All samples will be shipped overnight by express air service or, delivered by a courier or field sampling personnel. In the event that samples cannot be shipped or delivered until the following business day, the packaged samples will be held overnight under custody at a facility with restricted entry (authorized personnel only).

2.7.5 Laboratory Coordination

Sample shipments, data packages, data validation, and document control are all part of sample management. All scheduling for sample containers, analytical work, and data dispersal will be arranged in close consultation with the laboratory. The following steps will require close interface:

- Reviewing the number of samples to be submitted for analysis
- Reviewing the analytical requirements, bottles needed, blank requirements, and volumes required for sample analysis
- Coordinating special analytical requirements with the laboratory QA manager
- Determining the approximate dates sampling will occur and informing the laboratory
- Scheduling sample container shipments
- Informing the laboratory of the need for analytical results in both hardcopy and diskette formats

Laboratory assignment, scheduling, and oversight will be conducted through EPA's regional sample control coordinator (RSCC). The RSCC will be notified by telephone each time a sample shipment to the laboratory is made.

2.8 FIELD DOCUMENTATION

In addition to individual sample station documentation, all daily field activities will be documented in indelible ink in a bound waterproof logbook or on daily field log forms. At a minimum, the field crew will record the following information in the daily logbook:

- Date and time of entry (24-hour clock)
- Project name and location
- Project number
- Time and duration of daily sampling activities
- Weather conditions
- Variations, if any, from required sampling protocols and reasons for deviations
- Name of person making entries and other field personnel
- On-site visitors, if any
- General methods of sample collection
- Cross-reference list for EPA and Weston sample numbers

2.9 INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation-derived waste (IDW) generated as a result of field activities detailed in this FSP will be managed in accordance with EPA Region X guidance as well as all applicable federal, state, and local regulations and will be handled in a manner consistent with ultimate disposition. IDW is anticipated to include personal protective equipment (chemical protective clothing, nitrile gloves, etc.), decontamination waste (water and potentially contaminated material), soil/sediment cuttings from subsurface borings, and purge water from groundwater monitoring well sampling events.

IDW will be segregated by waste type and anticipated hazard prior to disposal. Containers (e.g., 55 gallon, DOT approved IDW drums) used for potentially hazardous waste materials (e.g., soil cuttings, purge water, decon water) will be labeled with permanent and unique numbers on the tops and sides. The contents of each container, the date the contents were first placed in each container, and a contact's name and phone number will also be conspicuously noted on the exterior of the containers.

Personnel protective equipment and other solid wastes will be grossly cleaned of all soil, bagged and taped, and disposed in a dumpster.

SECTION 3

QUALITY ASSURANCE PROJECT PLAN

3.1 DISTRIBUTION LIST

QAPP Distribution List

Name	Title	Organization	Telephone / E-mail Address
Sean Sheldrake	EPA Project Manager	U.S. Environmental Protection Agency Seattle, Washington	Phone: (206) 553-1220 e-mail: sheldrake.sean@epa.gov
Barry Towns	EPA QA Manager	U.S. Environmental Protection Agency Seattle, Washington	Phone: (206) 553-1675 e-mail: towns.barry@epa.gov
Laura Castrilli	EPA Regional Sample Control Coordinator	U.S. Environmental Protection Agency Seattle, Washington	Phone: (206) 553-4323 e-mail: castrilli.laura@ epa.gov
David Dinkuhn	Weston Field Leader	Weston Solutions, Inc. Seattle, Washington	Phone: (206) 521-7637 e-mail: d.dinkuhn@westonsolutions.com
Larry Vanselow	Weston Project Manager	Weston Solutions, Inc. Seattle, Washington	Phone: (206) 521-7681 e-mail: larry.vanselow@ westonsolutions.com
Paul Swift	Weston QA Officer	Weston Solutions, Inc. Seattle, Washington	Phone: (206) 521-7625 e-mail: paul.swift@ westonsolutions.com

3.2 PROJECT/TASK ORGANIZATION

3.2.1 Purpose

(The purpose of the project has been described in Section 1.1.)

This document is a site-specific Quality Assurance Project Plan (QAPP) for field and laboratory analysis activities. The QAPP includes a brief site summary, project objectives, analytical procedures, and QA requirements that will be used to obtain valid, representative field and laboratory analytical measurements. The QAPP is intended to be combined with information presented in Weston's Quality Management Plan (QMP; Weston 2003d). Copies of the QMP and the site-specific Health and Safety Plan (prepared for the field work) are available in Weston's office located at 190 Queen Anne Avenue North, Suite 200, Seattle, Washington 98109-4926.

3.2.2 Roles and Responsibilities

This section lists the individuals directly involved with the Frontier Hard Chrome ISRM Source Area Treatment project and their specific responsibilities. Lines of communication are shown in the Project Organization Chart (Figure 4).

The following are the Key Project Personnel:

- EPA Project Manager: Sean Sheldrake, EPA, Seattle, WA
- Weston Project Manager: Larry Vanselow, Weston, Seattle, WA
- Weston Field Leader: David Dinkuhn, Weston, Seattle, WA
- Weston QA Officer: Paul Swift, Weston, Seattle, WA

3.2.2.1 EPA Region 10 Project Manager (PM)

The EPA PM for this project is Sean Sheldrake. Mr. Sheldrake is the overall project coordinator, decision maker, primary point of contact for general project problem resolution, and has approving authority for the project. He will review and approve the work plan and subsequent revisions in terms of project scope, objectives, and schedules. He also will ensure that the QAPP is implemented properly.

3.2.2.2 EPA Region 10 Quality Assurance (QA) Manager

The EPA Region 10 QA Manager is Barry Towns. Mr. Towns(or his designee) reviews and approves the QAPP and revisions. He also may conduct assessments of field activities.

3.2.2.3 EPA Region 10 Regional Sample Control Coordinator (RSCC)

The EPA Region 10 Regional Sample Control Coordinator is Laura Castrilli. Ms. Castrilli coordinates sample analyses performed through the EPA Contract Laboratory Program (CLP) and/or the EPA Region 10 Manchester Environmental Laboratory (MEL) and provides sample identification numbers.

3.2.2.4 Weston Project Manager (PM)

The Weston START PM is Larry Vanselow. Mr. Vanselow has the responsibility for the overall performance of the Weston team, and is the primary contact point with the EPA PM. He will review and approve the Sampling and Analysis Plan. He makes the ultimate decisions for the implementation of the project and ensures that the implementation of the project is performed in accordance with the specifications of the Sampling and Analysis Plan and Weston's QMP and SOPs. Mr. Vanselow has overall responsibility for maintaining project budget and schedule.

3.2.2.5 Weston Field Leader

The Weston Field Leader is David Dinkuhn. Mr. Dinkuhn provides overall coordination of field work. He will ensure that the Sampling and Analysis Plan is implemented correctly and will record any deviations from it. Mr. Dinkuhn will receive the CLP/Region 10 laboratory information from the RSCC and is the primary Weston point of contact for field sampling problems. He will be responsible for the execution of decisions and courses of action deemed appropriate by the Weston or PNNL PM. Mr. Dinkuhn also will serve as Weston's site Health and Safety Officer.

3.2.2.6 Weston QA Officer

The Weston QA Officer is Paul Swift. Dr. Swift will review and approve the Sampling and Analysis Plan, will conduct in-house audits of field operations, and will be responsible for auditing and reviewing the field activities, final deliverables, and if necessary, for approving corrective actions for nonconformities. Dr. Swift will oversee the implementation of the SAP and evaluate the data generated. He also ensures that the implementation of the project is performed in accordance with the specifications of Weston's QMP and SOPs.

3.3 PROBLEM DEFINITION/BACKGROUND

This section discusses the site background and location.

3.3.1 Site Background

(Site background has been discussed in Section 1.2.)

3.3.2 Site Location and Identification

Site Name:	Frontier Hard Chrome, Inc.
CERCLIS ID No.:	WAD053614988
Location:	113 Y Street Vancouver, Washington 98661
Latitude:	45° 37' 16"
Longitude:	122° 38' 39"

3.4 PROJECT/TASK DESCRIPTION AND SCHEDULE

(Project description and schedule have been discussed in Section 2.)

3.5 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The project data quality objectives are to provide valid data of known and documented quality. The DQO process applied to this project followed that described in the EPA document, *Guidance for the Data Quality Objectives Process* (EPA 1994).

3.5.1 DQO Data Categories

All samples analyzed under this QAPP will be analyzed using definitive analytical methods unless standard methods do not exist. All analytical methods employed for this project will be methods approved by the EPA. The data generated under this project will comply with the

requirements for this data category as defined in *Data Quality Objective Process for Superfund* (EPA 1993).

3.5.2 Data Quality Indicators (DQIs)

DQI precision, accuracy, representativeness, comparability, and completeness goals for this project were developed following guidelines presented in the EPA *Guidance for Quality Assurance Project Plans QA/G5* (EPA 600/R-98/018, Appendix D).

The basis for assessing each of the elements of data quality is discussed in the following subsections. Table 2 presents the QA objectives for measurement of analytical data and QC guidelines for precision and accuracy. Other DQI goals are included in the laboratories' Standard Operating Procedures (SOPs) (to be assigned) and Statements of Work (SOW).

3.5.2.1 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a population, including a sampling point, a process condition, or an environmental condition. Representativeness is the qualitative term that should be evaluated to determine that measurements are made and physical samples collected at locations and in a manner resulting in characterizing a matrix or media. Subsequently, representativeness is used to ensure that a sampled population represents the target population and an aliquot represents a sampling unit.

Further, all sampling procedures detailed in the field sampling plan (FSP) will be followed to ensure that the data will be representative of the media sampled. The FSP describes the sample location, sample collection and handling techniques to minimize potential contamination or compromise sample integrity, and proper chain of custody. Additionally, the sampling design presented in the FSP will ensure that there are a sufficient number of samples and level of confidence that analysis of these samples will detect the chemicals of concern, if present.

3.5.2.2 Comparability

Comparability is the qualitative term that expresses the measure of confidence that two data sets or batches can contribute to a common analysis and evaluation. Comparability with respect to laboratory analyses pertains to method type comparison, holding times, stability issues, and aspects of overall analytical quantitation. The following items are evaluated when assessing data comparability:

- Determining if two data sets or batches contain the same set of parameters
- Determining if the units used for each data set are convertible to a common metric
- Determining if similar analytical procedures and quality assurance were used to collect data for both data sets
- Determining if the analytical instruments used for both data sets have approximately similar detection levels
- Determining if samples within data sets were selected and collected in a similar manner

To ensure comparability of data collected during this investigation to other data that may have been or may be collected for the site, standard collection and measurement techniques will be used.

3.5.2.3 Completeness

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not rejected through data validation. The requirement for completeness is 90% for aqueous samples and 90% for solid samples.

The following formula is used to calculate completeness:

$$\%\,\text{completeness} = \frac{\text{number of valid results for samples analyzed}}{\text{number of possible results for all samples}} * 100$$

3.5.2.4 Precision

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. *Analytical* precision is the measurement of the variability associated with duplicate (two) or replicate (more than two) analyses. The laboratory control sample (LCS) determines the precision of the analytical method. The comparison is not between a sample and a duplicate sample analyzed in the same batch. Rather, the comparison is between the sample and samples analyzed in previous batches.

Total precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and sample matrix duplicate spiked samples shall be analyzed to assess field and analytical precision, and the precision measurement is determined using the relative percent difference (RPD) between the duplicate sample results.

The following formula is used to calculate precision:

$$\text{RPD} = (100) \times \frac{(S_1 - S_2)}{(S_1 + S_2)/2}$$

where:

S_1 = normal sample value
S_2 = duplicate sample value

3.5.2.5 Accuracy

Accuracy is a statistical measurement of correctness and includes components of random uncertainty (variability due to imprecision) and systemic uncertainty. It reflects the total uncertainty associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into an LCS or MS sample to a control limit. Analysis of performance evaluation (PE) samples also may be used to provide additional information for assessing the accuracy of the analytical data being produced.

3.6 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

No special training requirements or certifications are required for this project except for the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) class and annual refreshers. Health and safety procedures for Weston personnel and Weston subcontractors are addressed in the Weston site-specific health and safety plan. Copies of this document are maintained in Weston's Seattle office and at the project site. Included in the plan are descriptions of anticipated chemical and physical hazards, required levels of protection, health and safety monitoring requirements and action levels, personal decontamination procedures, and emergency procedures. All field personnel and required to read and comply with the plan.

3.7 DOCUMENTATION AND RECORDS

This QAPP is meant to be combined with information presented in Weston's QMP (Weston 2003d). A copy of the QMP is available in Weston's Seattle office. Standards contained in the SOPs and the QMP will be used to insure the validity of data generated by Weston for this project.

Following the completion of fieldwork and the receipt of analytical data, a report summarizing project findings will be prepared. Project files including work plans, reports, analytical data packages, correspondence, chain-of-custody documentation, original logbooks, corrective action forms, referenced materials, and photographs will be provided to the EPA PM at the close of the project, as needed.

3.8 MEASUREMENT/DATA ACQUISITION

3.8.1 Sampling Process Design (Experimental Design)

(The experimental design has been described in Section 2.)

3.8.2 Sampling Methods Requirements

(The sampling methods requirements have been described in Section 2.)

3.8.3 Sample Handling and Custody Requirements

(The sampling methods requirements have been described in Section 2.6.)

3.8.4 Analytical Methods Requirements

Analyses of samples collected during the field event will be performed by the EPA Region 10 MEL or a CLP laboratory designated by the EPA unless issues arise regarding capability or capacity. In this case, analyses may be conducted by a commercial laboratory under subcontract to Weston. The analyses to be applied to samples sent to the laboratories are listed in Table 2. These analyses were selected based on the specifications in this work plan.

EPA and/or CLP laboratory analyses will take place under the standard three-week turnaround time period. Weston-subcontracted laboratory analyses will take place under the standard four-week turnaround time period. Table 2 summarizes laboratory instrumentation and methods to be used for the studies.

3.8.5 Quality Control Requirements

QC checks for sample collection will be accomplished by a combination of Chain-of-Custody protocols and laboratory quality assurance as prescribed in the sampling or analytical methods. No QC samples (i.e., double blind performance evaluation samples) are planned for this activity outside of normal laboratory QC criteria outlined in the analytical methods. These QC measures include ambient, rinsate, trip, and method blanks, matrix, surrogate, and internal standards spikes recovery, serial dilution analysis, interference check sample analysis, and calibration check sample recovery.

All of the analyses that will be performed for this project will produce definitive data. The laboratories' DQOs for completeness and the field team's ability to meet the DQO for representativeness are set at 90% for data generated from this study. Precision and accuracy requirements are outlined in Table 2.

3.8.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The field equipment used during this project includes water quality meters to measure temperature, pH, dissolved oxygen, conductivity, and ORP in groundwater samples, and a water level measuring tape. Testing, inspection, and maintenance of these instruments will be performed in accordance with the manufacturer's recommendations and/or the SOPs provided in Appendix A. Spare parts for the field equipment will be available from the manufacturer generally within 24 hours.

All field instruments and equipment used for analysis will be serviced and maintained only by qualified personnel. All instruments will be maintained by senior staff and/or electronics technicians. All repairs, adjustments, and calibrations will be documented in an appropriate logbook or data sheet that will be kept on file. The instrument maintenance logbooks will clearly

document the date, the description of the problems, the corrective action taken, the result, and who performed the work.

All equipment used in the field is subject to standard preventive maintenance schedules established by equipment manufacturer protocols. When in use, equipment will be inspected at least twice daily, once before startup in the morning and again at the end of the work shift before overnight storage or return to the charging rack. Regular maintenance is to be conducted according to manufacturer's recommendations and in the field as needed, whichever is appropriate. Routine maintenance typically includes daily calibration, replacement of batteries as needed, and replacement of oxygen sensor membrane (dissolved oxygen meter) as needed. All performed preventive maintenance will be entered in the individual equipment's logbook and in the site field logbook.

In addition to preventive maintenance procedures, daily calibration checks will be performed at least once daily before use and recorded in the respective logbooks. Additional calibration checks will be performed as required. All logbooks will become part of either the permanent site file or the permanent equipment file.

3.8.7 Instrument Calibration and Frequency

All instruments and equipment used during fixed laboratory sample analyses will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references and/or in accordance with the laboratory's Quality Assurance Manual and SOPs.

No calibration is required for the water level measuring tape. For the water quality meters, the calibration will be performed in accordance with the manufacturer's recommendations and the SOPs provided in Appendix A.

3.8.8 Inspection/Acceptance Requirements for Supplies and Consumables

This information is covered by the SOPs and the QMP (Weston 2003d). Standards contained in these documents will be used to ensure the validity of data generated by Weston for this project. Sample jars are pre-cleaned by the manufacturer; certification documenting this is enclosed with each box of jars. Weston will include this documentation as part of the project file. Non-dedicated equipment is demonstrated to be uncontaminated by the use of rinsate blanks.

3.8.9 Data Acquisition Requirements (Non-direct Measurements)

No data will be used from other sources.

3.8.10 Data Management

Respective hardcopy results from the EPA and/or CLP laboratories will be delivered to Weston upon completion of each sample delivery group. Electronic results from the EPA and/or CLP laboratories will be delivered to the Weston upon project completion. Hardcopy and electronic

data results from the subcontracted commercial laboratory will be delivered to Weston upon completion of each sample delivery group. A full documentation data deliverable (raw and final data) will be submitted by the subcontract laboratory; data validation will be performed as listed in Section 4.1. Data tracking, storage, and retrieval are tracked through the TDD "blue sheet," which records where the paper and electronic data are located. All paper data are stored in locked file cabinets; access to these files is restricted to key Weston personnel. Electronic data are archived by Weston work order number.

Weston may use Microsoft Access software and the following procedures to compile and manage two major but related types of data; GIS (or location) data and chemical analysis data.

GIS data are collected as required by a given project. When GIS data are collected, the following fields are captured as appropriate:

- Station Identifier
- Station Alternate or Previous IDs
- Station Type Description
- Station Coordinates
- Station Horizontal Datum (if applicable)
- Method for determining Station Location
- Station Coordinate Units
- Station Elevation
- Station Vertical Datum (if applicable)
- Method for determining Station Elevation

and appropriate Station Attributes such as:

- Well Depth
- Well Screening Interval
- Depth of Water
- Sediment or Soil Sampling Interval

The major data items captured to create a complete chemical analytical dataset are as follow:

- Station Identifier
- Sample Identifier
- Sample Description (Primary, Field, Duplicate, Replicate…)
- Sample Date
- Full name of analytical parameter, observation or compound analyzed
- CAS number when available or appropriate
- Analytical result concentration value
- Data validation qualifier
- Units
- Analytical method reference
- Sample Media
- Sample Media modifier

3.9 ASSESSMENT/OVERSIGHT

3.9.1 Assessments and Response Actions

The Weston QA Officer or designee may conduct an audit of the field activities for this project. The auditor will have the authority to issue a stop work order upon finding a significant condition that would adversely affect the quality and usability of the data. The Weston PM will have the responsibility for initiating and implementing response actions associated with findings identified during the site audit. Once the response actions have been implemented, the Weston QA Officer or designee may perform a follow-up audit to verify and document that the response actions were implemented effectively. In-house audits performed by Weston may be conducted in accordance with the QMP (Weston 2003d). No audits are planned for the Frontier Hard Chrome Remediation Action project.

If major deviations from the QA requirements of the project are observed during the data validation process, Weston may contact the laboratory to correct the problem. If the laboratory will not be responsive to the request, Weston will inform the EPA PM of the situation. A brief narrative will be written explaining the analytical deviations and recommendations will be given based on the quality of the submitted data.

3.9.2 Reports to Management

Debriefing of the EPA PM occurs by the Weston PM on a "as-needed" basis. Standard laboratory deliverables will be as specified in the laboratory statements of work for CLP and/or MEL data, as specified in the laboratory subcontract bid specification package for commercial laboratory analyses, and as specified in the Environmental Services Assistance Team (ESAT) contract for on-site analyses. Once the project is complete and the resulting data is obtained, the Weston PM will assist in preparation of a final project report. The report will include a summary of the activities performed during the project and the resulting data (along with any statements concerning data quality). The report will be approved by the EPA PM prior to forwarding to the individuals identified in the distribution list located in the Table of Contents section of this document.

Weston's corrective action program is addressed in Section 3 of the QMP. Corrective actions will be conducted in accordance with these QMP specifications.

3.9.3 Data Validation and Usability

The data validation review of data deliverables will include an evaluation of: the information provided on the analytical data sheets and required support documentation for all sample analyses; the supporting sample collection documentation, including chain-of-custody; and field instrument calibration, results, and/or performance check documentation (if required by the method). The QA review will also examine adherence to the procedures as described in the cited SOPs and the specified analytical methods in the QAPP.

3.9.4 Data Review, Validation, and Verification Requirements

Analytical data generated through the CLP contract or by MEL for the remedial action will be validated by Weston (as required), as will data generated through subcontract laboratories. The data validations will be performed on a one-week turn around time that starts upon receipt of the complete analytical data package from the laboratory.

3.9.5 Validation and Verification Methods

All of the data validations will be performed in accordance with the QA/QC requirements specified in the QAPP, the technical specifications of the analytical methods and the

- EPA CLP National Functional Guidelines for Inorganic Data Review (1994a)
- EPA CLP National Functional Guidelines for Organic Data Review (1999)

Validation deliverables will include a QA memo discussing QA conformance and deviations issues that may have affected the quality of the data. Data usability and the bases of application of qualifiers will also be discussed in the QA memo. Forms I (Analysis Data Sheet) with the applied validation qualifiers for estimated-qualified values also will be a part of the validation deliverables. The following qualifiers shall be used in the data validation:

U — The compound was analyzed for, but not detected.

UJ — The compound was analyzed for, but was not detected; the associated quantitation limit is an estimate because quality control criteria were not met.

J — The analyte was positively identified, but the associated numerical values is an estimate quantity because quality control criteria were not met or because concentrations reported are less than the quantitation limit or lowest calibration standard.

NJ — The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

R — Quality control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

3.9.6 Reconciliation with User Requirements

The data quality indicators' targets for this project are discussed in Section 1.5 of this QAPP. The data validation will be used as a tool to determine whether these targets were met. Also, using the compiled data, the Weston QA Officer will determine variability and soundness of the data and the data gaps that will need to be filled to meet the objectives of the project.

SECTION 4

REFERENCES

EPA (United States Environmental Protection Agency). 2001. Contract Laboratory Program (CLP) Guidance for Field Samplers, Draft Final. OSWER 9240.0-35, EPA540-R-00-003. June.

EPA. 2001. Contract Laboratory Program Guidance for Field Samplers, EPA/540/R-00/003.

EPA. 1999. Contract Laboratory Program National Functional Guidelines for Organic Data Review, 540/R-99/008.

EPA. 1994. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, 540/R-94/013.

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